

## **SUBJECT: A380 ETOPS Certification – Petition for Exemption Request to 14 CFR K25.1.4 (a)(3)**

The purpose of this document is to present the Airbus proposal for a petition for exemption for a 4-year period (from present petition date) to the existing requirement K25.1.4 (a)(3) related to the ETOPS low fuel alert requirement and in particular the saliency and persistence of this ETOPS low fuel alert.

### **APPLICABILITY**

This petition is applicable for all current A380 models (i.e. A380-841, A380-842 and A380-861), as referenced in the Airbus application for FAA ETOPS Beyond 180 minute certification dated February 05<sup>th</sup>, 2018 and the A380 FAA ETOPS beyond 180 min Certification Plan dated June 28<sup>th</sup>, 2018;

### **PUBLIC INTEREST**

Airbus believes that it is in the public interest to approve this petition in that the A380 design meets both the letter and intent of 14 CFR Part 25 Appendix K, specifically *K25.1.4(a)(3)*. In addition, the ETOPS beyond 180 minute design approval offers to the airlines operating under FAA ETOPS regulations additional reliability, flexibility and safety in terms of routes selection (for example, use of alternate airports that are better equipped and/or with better weather conditions and selection of better routings for en-route weather conditions).

Operating with ETOPS beyond 180 minute authority also enables the airlines to contribute positively to the environmental impact by selecting more direct routings, therefore reducing the CO2 emissions due to the lower overall fuel burnt.

The operational optimization brought by the ETOPS beyond 180 minutes design approval and operating authority through enhanced operational reliability and optimized fuel consumption will lead to a reduction of the operational costs for airlines. This exemption will allow the airlines operating A380 model series under FAA ETOPS regulations to benefit from this ETOPS beyond 180 minute operational optimization.

Finally, the public will also benefit from the operational optimization brought by the granting of this ETOPS beyond 180 minutes capability as it will bring enlarged and more competitive travel offers.

### **PETITION ARGUMENTATION AND JUSTIFICATIONS**

Title 14 CFR, Part 25, Appendix K, Section K25.1.4(a)(3) states that:

## QUOTE

*K25.1.4(a)(3) An alert must be displayed to the flightcrew when the quantity of fuel available to the engines falls below the level required to fly to the destination. The alert must be given when there is enough fuel remaining to safely complete a diversion. This alert must account for abnormal fuel management or transfer between tanks, and possible loss of fuel. This paragraph does not apply to airplanes with a required flight engineer.*

## UNQUOTE

In the context of this ETOPS Certification exercise of the A380, it has been verified that possible low fuel conditions are detected and announced as follows:

- For possible low fuel conditions due to detected aircraft system failures and anomalies or crew errors: these are detected by the fuel and engine systems and announced on the Electronic Centralized Aircraft Monitoring (ECAM) system.
- For possible low fuel conditions due to unanticipated operating conditions or other reasons: these are detected by the Flight Management System (FMS) and announced on the FMS page of the Multi-Function Display (MFD) display.

The A380 fuel alerting system is similar to that of the A350 or the A330, which both have been certified for ETOPS beyond 180 min by the FAA. Accordingly the A380 ETOPS Low Fuel Alerting is therefore made of:

- ATA 22 “DEST EFOB BELOW MIN” Message generated by the FMS;
- ATA 28 Detection of fuel leaks upstream the fuel flow meter;
- ATA 71 Detection of fuel leaks downstream the fuel flow meter.

The intent of K25.1.4 (a)(3) is to provide crew awareness when the fuel available to the engines falls below the level required to fly to the destination. Airbus believes that the Airbus design described above satisfies this requirement.

Although the language of Appendix K to Part 25, K25.1.4(a)(3) does not explicitly require it, Airbus understands that FAA interprets the regulation to require that low fuel conditions detected by the Flight Management System (FMS) and announced on the FMS page of the Multi-Function Display (MFD) display should also be displayed on the ECAM to ensure the saliency and persistence of the related low fuel alert message generated by the FMS.

The only relevant difference with the A350 or the A330 is that the message generated by the FMS is not repeated on the ECAM of current A380 aircraft. Airbus believes that the existing system design (i.e. without having the “DEST EFOB BELOW MIN” Message generated by the

FMS repeated on the ECAM) provides a similar performance level and meets the overall intent of the regulation. Pending the incorporation of an ECAM Memo associated to “DEST EFOB BELOW MIN” FMS Message, the consideration of the following additional fuel quantity awareness and verifications ensures that the existing system design provides an equivalent level of performance to what is expected by the FAA requirements with regards to the saliency and persistence of the low fuel alert message:

- Update of the A380 FCOM cruise SOP, to require the flight crew to perform the following actions when overflying a waypoint (or every 30 min at the latest):
  - Check the FOB on the permanent data, and the fuel predictions in the FMS ACTIVE/FUEL & LOAD FMS page, and compare them with the computerized flight plan.
  - Check that there is no fuel leak.
  - On the CRUISE page, check the (FOB + FU)-BLOCK.
  - On the FMS ACTIVE/FUEL & LOAD page, check/compare the DEST EFOB with the MIN FUEL AT DEST.
- Accordingly, the SOP will be updated to underline that the DEST EFOB value on the FMS ACTIVE/FUEL & LOAD page appears in amber, and the DEST EFOB BELOW MIN message appears on the FMS message area if the EFOB at destination (DEST EFOB) is below the specified MIN FUEL AT DEST.
- During the exemption period, Airbus will make changes to the existing A380 ETOPS Low Fuel Alerting architecture to incorporate an ATA 31 “DEST EFOB” ECAM Memo associated to “DEST EFOB BELOW MIN” FMS Message. In the interim of the embodiment of this ECAM Memo, the above items of the A380 FCOM cruise SOP will be mandated through a reference in a dedicated item of the A380 ETOPS CMP document that will be approved in the frame of this FAA ETOPS certification exercise.

Airbus considers that the involved workload to maintain awareness of fuel quantity by the crew during the course of an ETOPS flight is minimal and that this small increase does not raise the level of pilot workload to unacceptable levels throughout any possible divert.

Considering the one-engine-inoperative speed of the A380, the operational approval for ETOPS beyond 180 minutes will be limited to areas south of the equator, mainly South Pacific and South Pole regions. Therefore, exposure to ETOPS beyond 180 minutes is small compared to operations within 180 minutes which will remain the majority of the flights.

Airbus requests a 4-year exemption period based on the following timeline:

- 2 to 3 years for development and certification of software change for ATA 31 “DEST EFOB” ECAM Memo

- 1 year for incorporation by the operator after software change is certified

## **SUMMARY**

To sum-up what has been detailed above for all applicable models of the A380:

- the A380 ETOPS Low Fuel Alerting, which is made of the ATA 22 “DEST EFOB BELOW MIN” Message generated by the FMS, the ATA 28 Detection of fuel leaks upstream the fuel flow meter and the ATA 710 Detection of fuel leaks downstream the fuel flow meter complies with the letter and intent of section K25.1.4(a)(2); and
- To address FAA policy requiring that low fuel conditions detected by the Flight Management System (FMS) and announced on the FMS page of the Multi-Function Display (MFD) display should also be displayed on the ECAM, the existing A380 ETOPS Low Fuel Alerting architecture will be modified to incorporate a dedicated ATA 31 “DEST EFOB” ECAM Memo associated to “DEST EFOB BELOW MIN” FMS Message; and
- Pending incorporation of this new ECAM Memo associated to “DEST EFOB BELOW MIN” FMS Message, the A380 FCOM cruise SOP and the A380 ETOPS CMP document will require to perform periodic check of the FMS FUEL & LOAD page, to ensure that any “DEST EFOB BELOW MIN” condition is duly noted by the flight crew.

In conclusion, based on the above described arguments and justifications, Airbus believes that the A380 ETOPS Low Fuel Alerting meets the safety objectives of ETOPS operations beyond 180 minutes. Airbus acknowledges that existing system design does not provide an ECAM Memo associated to “DEST EFOB BELOW MIN” FMS Message, which will be developed and introduced during the requested exemption period of 4 years (from petition date).

Accordingly, with due consideration of the proposed SOP and ETOPS CMP updates, Airbus firmly believes that the A380 ETOPS Low Fuel Alerting meets the overall regulatory intent of 14 CFR K25.1.4 (a)(3), and is looking forward to getting FAA concurrence on this above-mentioned petition for exemption request.